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Gliding Submarine

Abstract

The present invention provides a gliding submarine which is operated and driven by man power mainly and which advances by using the power converted from reciprocally changing gravity and buoyancy. A gliding submarine according to the present invention is driven by using gliding wings or a screw propeller when under water and by using a sail or a screw propeller when on water. The gliding submarine comprises a high pressure-resistant body, wings, an ascending and descending water bag, a water tank, an ascending and descending helm, a vertical empennage, a treadle screw propeller power system, a treadle water-discharging plunger cylinder system etc. The submarine is driven by the sail wing and by treadling the screw propeller when it is on water while it advances by using the power converted by the wings from reciprocally changing gravity and buoyancy caused by changes of the specific gravity thereof when it is under water.

What is claimed is:

1. A gliding submarine capable of being operated both on and under water and provided with three driving means like gliding, sailing and screw propelling, comprising: a body, wings, an ascending and descending helm, a vertical empennage, a treadle screw propeller

power system, a treadle water-discharging plunger cylinder system, a water tank, an ascending and descending water bag, a sail and an operating system, and a life-support system, communication and GPS, a sonar system and etc., characterized in that: an ascending and descending helm 2, an ascending and descending water bag 3, an oxygen supply hole and tow point 4, a door and observing window 5, a vertical empennage 6, wings or sails 7, a screw propeller 8, a sail fixing bolt 9, a sail ascending and descending control rope 10, a helm 11, an elastic sail fixing rope 12, a collision protection point and a rope transmission control and fixing wheel 13, an adjustable sail fixing bolt 14, a sail angle control wheel and a point 15 for the sail accessing the body of the submarine, a sail supporting rod 16, a sail top supporting rod 17, a sail bottom supporting rod 18 etc. are provided outside a body of the submarine, a sail angle control wheel 20, a sail ascending and descending wheel 21, a seat 22, a screw propeller transmission shaft 23, a water tank 24, a treadle umbrella gear disc 27, a screw propeller shaft head engaging umbrella gear 28, a high-pressure oxygen bottle 29, air charging valve 30, water bag discharging valve 31, plunger cylinder treadles 32, a treadle linking shank 33, plunger cylinders 34, a water tank single-direction discharging valve 35, a single-direction valve 36, a descending control valve 37, a water tank discharging valve 38, an air inlet valve 39, a

submarine over-pressure protection air-charging valve 40 etc. are provided inside the body of the submarine, characterized in an operation process comprising the following steps: opening the descending control valve 37 to convert an on-water operation status of the submarine into an under-water operation status thereof, as under normal condition, a water pressure in the outside ascending and descending water bag 3 is always higher than that in the inside water tank 24, water in the outside water bag 3 flows towards the inside water tank 24 to cause the shrinkage of the water bag 3 so that a volume of water discharged from the submarine decreases gradually and the depth of the submarine in the water increases gradually; at the time when the submarine sinks into the water as the volume shrinks to an extent when a specific gravity thereof is greater than the water, closing the valve and pulling the operating rod of the ascending and descending helm 2 to adjust the same to an appropriate angle so that the submarine advances downwardly in a desired angle; treadling the plunger cylinder treadles 32 to cause the plunger cylinders to work so that water in the water tank 24 is discharged into the water bag 3 through the water tank single-direction discharging valve 35 and the single-direction valve 36 to cause the expansion of the water bag 3 and thus the gradual decrease of the specific gravity of the submarine; adjusting the ascending and descending helm 2 to an appropriate angle

so that the submarine advances upwardly in a desired angle till it appears on water again at the time when the submarine starts to float up as the specific gravity becomes smaller than that of water; re-discharging water in the water bag 3 into the water tank and repeating the previous cycle of descending to keep the submarine to advance under water in a zigzag way by reciprocal charging and discharging when the submarine arrives a certain height if the submarine is not allowed to appear on water;

2. The gliding submarine according to claim 1, characterized in that: the sails 7 have adjustable work status allowing the sails 7 to work as the wings of the submarine when under water, in which the sail fixing bolt 9, the elastic sail fixing rope 12 and the adjustable sail fixing bolt 14 are used to fix the sails to the body of the submarine on an upper side thereof in a parallel direction;

3. The gliding submarine according to claim 1 or 2, characterized in that: when the submarine operates on water, the sail ascending and descending wheel 21 and the sail angle control wheel 20 are manipulated to allow the sails to rise through the sail ascending and descending control rope 10 and a wing angle control rope 19 and the angle fronting the wind is adjusted so that the submarine is driven by wind power;

4. The gliding submarine according to claim 1, characterized in that: the

treadle umbrella gear disc 27, the screw propeller shaft head engaging umbrella gear 28, the screw propeller transmission shaft 23 and a bearing 25 are provided inside the submarine; and the screw propeller 8 and the treadle umbrella gear disc 27 are provided outside the submarine so that the screw propeller transmission shaft 23 rotates the screw propeller 8 through the screw propeller shaft head engaging umbrella gear 28 and the rotation of the screw propeller 8 produces a driving force which acts on the body of the submarine through the bearing 25 to drive the movement of the submarine.

5. The gliding submarine according to claim 1, characterized in that: an ascending and descending helm 2, an ascending and descending water bag 3, an oxygen supply hole and tow point 4, a door and observing window 5, a vertical empennage 6, wings or sails 7, a screw propeller 8, a helm 11 are provided outside a body of the submarine; a seat 22, a screw propeller transmission shaft 23, a water tank 24, a helm operating rod 26, a treadle umbrella gear disc 27, a screw propeller shaft head engaging umbrella gear 28, a high-pressure oxygen bottle 29, air charging valve 30, water bag discharging valve 31, plunger cylinder treadles 32, a treadle linking shank 33, plunger cylinders 34, a water tank single-direction discharging valve 35, a single-direction valve 36, a descending control valve 37, a water tank discharging valve 38, an air inlet valve 39, a submarine over-pressure protection

air-charging valve 40 etc. are provided inside the body of the submarine, characterized in an operation process comprising the following steps: opening the descending control valve 37 to convert an on-water operation status of the submarine into an under-water operation status thereof, as under normal condition, a water pressure in the outside ascending and descending water bag 3 is always higher than that in the inside water tank 24, water in the outside water bag 3 flows towards the inside water tank 24 to cause the shrinkage of the water bag 3 so that a volume of water discharged from the submarine decreases gradually and the depth of the submarine in the water increases gradually; at the time when the submarine sinks into the water as the volume shrinks to an extent when a specific gravity thereof is greater than the water, closing the valve and pulling the operating rod of the ascending and descending helm 2 to adjust the same to an appropriate angle so that the submarine advances downwardly in a desired angle; treadling the plunger cylinder treadles 32 to cause the plunger cylinders to work so that water in the water tank 24 is discharged into the water bag 3 through the water tank single-direction discharging valve 35 and the single-direction valve 36 to cause the expansion of the water bag 3 and thus the gradual decrease of the specific gravity of the submarine; adjusting the ascending and descending helm 2 to an appropriate angle so that the

submarine advances upwardly in a desired angle till it appears on water again at the time when the submarine starts to float up as the specific gravity becomes smaller than that of water; re-discharging water in the water bag 3 into the water tank and repeating the previous cycle of descending to keep the submarine to advance under water in a zigzag way by reciprocal charging and discharging when the submarine arrives a certain height if the submarine is not allowed to appear on water;

6. The gliding submarine according to claim 1 or 5, characterized in that: in order to improve the running speed of the submarine, the ascending and descending water bag 3 is removed or no use is made of the ascending and descending water bag 3 so that sea water is injected directly into the water tank 24 inside the submarine when the submarine descends while water in the water tank 24 inside the submarine is discharged directly into the sea through the treadle plunger cylinders 34 when the submarine ascends.

7. The gliding submarine according to claim 1 or 5, characterized in that: a high-pressure oxygen bottle 29, air charging valve 30, and a submarine over-pressure protection air-charging valve 40 are provided inside the body of the submarine, the air charging valve 30 and the submarine over-pressure protection air-charging valve 40 being connected to respective mechanical and electrical protection means to

carry out the following functions: the valve opens to discharge part of water in the water tank outside the submarine to allow the submarine to ascend when the submarine arrives the safety limit of descending while the operator fails to take necessary measures; if said step fails, air is then charged directly into the ascending and descending water bag 3 through the air charging valve 30 to force the submarine to ascend for protecting the safety of personnel inside the submarine.

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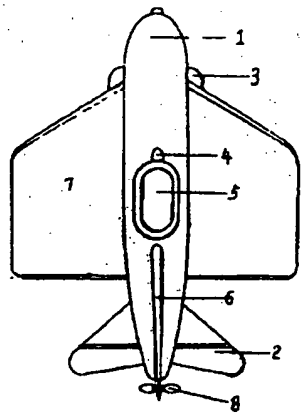
[57]摘要

本发明提供了一种靠人力操纵和驱动的主要将往复变化的重力与浮力转换 成前进动力的滑翔潜艇。本潜艇在水下采用滑翔翼或螺旋桨驱动的、在水面采 用风帆或螺旋桨驱动的。这种滑翔潜艇是由高耐压艇体、艇翼、升降水囊、水 箱、升降舵、垂直尾翼、脚踏螺旋桨动力系统、脚踏式排水柱塞缸系统等构 成。在潜艇处于水面状态时靠帆翼驱动和踏动螺旋桨驱动。在潜艇处于水下工作状态时，通过改变潜艇的比重使潜艇上浮和下沉，将这种重力与浮力的变化 通过艇翼变化成潜艇的前进动力。



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权利要求书

1、一种具有水下、水面两种工作性能和滑翔、风帆、螺旋桨三种驱动方式的滑翔潜艇，由艇体、艇翼、升降舵、垂直尾翼、脚踏螺旋桨动力系统、脚踏式排水柱塞缸系统、水箱、升降水囊、风帆及操纵系统、以及生命支持系统、通信及全球定位系统、声纳系统等构成，其特征是：在潜艇的艇外设有升降舵2、升降水囊3、供氧孔及拖拽点4、艇门及观测窗5、垂直尾翼6、艇翼或帆翼7、螺旋桨8、帆翼固定栓9、帆翼升降控制绳10、舵11、弹性帆翼固定绳12、防撞点及控制绳传动与固定轮13、可调帆翼固定栓14、帆翼角度控制轮及帆翼控制绳进入艇体点15、帆翼支撑杆16、帆翼顶端支撑杆17、帆翼底端支撑杆18等，在潜艇的艇内设帆翼角度控制轮20、帆翼升降控制轮21、座椅22、螺旋桨传动轴23、水箱24、脚踏式伞齿轮盘27、螺旋桨轴头啮合伞齿轮28、高压氧气瓶29、充气阀30、水囊排水阀31、柱塞缸脚踏板32、脚踏板联动杆33、柱塞缸34、水箱单向排水阀35、单向阀36、下潜控制阀37、水箱排水阀38、进气阀39、潜艇超压保护充气阀40等，其工作过程是：当要把潜艇从水面转入水下工作状态时，打开下潜控制阀37、因为艇外升降水囊3内的水的压力在正常情况下始终比艇内水箱24高，所以这时水囊3内的水向艇内水箱24流动，水囊3收缩，潜艇的排水体积逐步缩小，潜艇吃水深度逐步加深，当体积缩小到比重大于水时，潜艇就会下沉，这时关闭阀门，拉动升降舵操纵杆，调整好升降舵2的角度，就可以让潜艇成一定的角度向下前方运动，当潜艇达到安全深度的界限时，踏动柱塞缸脚踏板32，使柱塞缸34工作，通过水箱单向排水阀35和单向阀36，将水箱24内的水排到水囊内3，这时水囊3膨胀，潜艇的比重逐步下降，当比重小于水时，潜艇上浮，这时调整好升降舵2的角度，就可以让潜艇成一定的角度向上前方运动，直到浮出水面。如果不使潜艇浮出水面，可以在潜艇到达一定的高度后，将水囊3内的水再排入水箱，重复前一个下潜过程，这样往复排放，使潜艇成之字形在水下前进。

2、根据权利要求1所述的滑翔潜艇，其特征是：帆翼7的工作状态是可调的，在水下它是以艇翼的方式工作，帆翼固定栓9、弹性帆翼固定绳12、可调帆翼固定栓14将帆翼与艇体平行的固定在艇体的上方。

8、根据权利要求1、或2、所述的滑翔潜艇，其特征是：当潜艇在水面运行时，操纵帆翼升降控制轮21和帆翼角度控制轮20、通过帆翼升降控制绳10和翼角度控制绳19将帆翼升起，调整好迎风角度，就可以靠风力驱动。

4、根据权利要求1所述的滑翔潜艇，其特征是：在潜艇内设有脚踏式伞齿轮盘27、螺旋桨轴头啮合伞齿轮28、螺旋桨传动轴23以及推力轴承及轴封25，在艇外设有螺旋桨8，踏动脚踏式伞齿轮盘27、通过螺旋桨轴头啮合伞齿轮28、螺旋桨传动轴23就可以带动螺旋桨8旋转，螺旋桨8旋转产生的推力通过推力轴承25作用到船体，推动潜艇运动

5、根据权利要求1所述的滑翔潜艇，其特征是：在潜艇的艇外设有升降舵2、升降水囊8、供氧孔及拖拽点4、艇门及观测窗5、垂直尾翼6、艇翼7、螺旋桨8、舵11，在潜艇的艇内设座椅22、螺旋桨传动轴23、水箱24、舵操纵杆26、脚踏式伞齿轮盘27、螺旋桨轴头啮合伞齿轮28、高压氧气瓶29、充气阀30、水囊排水阀31、柱塞缸脚踏板32、脚踏板联动杆33、柱塞缸34、水箱单向排水阀35、单向阀36、下潜控制阀37、水箱排水阀38、进气阀39、潜艇超压保护充气阀40等，其工作过程是：当要把潜艇从水面转入水下工作状态时，打开下潜控制阀37、因为艇外升降水囊8内的水的压力在正常情况下始终比艇内水箱24高，所以这时水囊8内的水向艇内水箱24流动，水囊8收缩，潜艇的排水体积逐步缩小，潜艇逐步下沉，当体积缩小到一定程度时，艇体的比重大于水，潜艇就会下沉，这时关闭阀门，拉动升降舵操纵杆，调整好升降舵2的角度，就可以让潜艇成一定的角度向下前方运动，当潜艇达到安全深度的界限时，踏动柱塞缸脚踏板32，使柱塞缸34工作，通过水箱单向排水阀35和单向阀36，将水箱24内的水排到水囊内8，这时水囊8膨胀，潜艇的比重逐步下降，当比重小于水时，潜艇上浮，这时调整好升降舵2的角度，就可以让潜艇成一定的角度向上前方运动，直到浮出水面。如果不使潜艇浮出水面，可以在潜艇到达一定的高度后，将水囊8内的水再排入水箱，重复前一个下潜过程，这样往复排放，使潜艇成之字形在水下前进。

6、根据权利要求1、或5所述的滑翔潜艇，其特征是：为加快潜艇的运行速度，去掉或设而不用升降水囊8，下沉时，将海水直接注入艇内水箱24，上浮时，将艇内水箱24的水通过脚踏柱塞缸34直接排入海洋。

7、根据权利要求1、或5所述的滑翔潜艇，其特征是：在艇内设有高压氧气瓶29和充气阀30以及潜艇超压保护充气阀40，充气阀30和潜艇超压保护充气阀40与相应的机械与电气保护部件连接，其功能是，当潜艇达到下潜安全极限而操作员未采取相应的措施时，此阀门打开，将艇内水箱的部分水排出艇内，使潜艇上浮。如果这一操作步骤无效，则通过充气阀30直接向升降水囊8内充气，使潜艇强行上浮，保护艇内人员的安全。

01.01.02
说 明 书

滑翔潜艇

本发明涉及一种主要将重力与浮力转换成前进动力的滑翔潜艇。

目前的潜艇按照配备的动力系统区分，有核动力潜艇、柴电混合动力潜艇，还有一种正在试制的燃料电池动力潜艇。这些类型的潜艇各有其特点和不足，但其一个共同的特点是必须配备动力系统，无法用人力驱动。

本发明的目的是要提供一种靠人力操纵和驱动的，在水下采用滑翔翼或螺旋桨驱动的、在水面采用风帆或螺旋桨驱动的潜艇。

本发明的目的是这样实现的：这种滑翔潜艇是由高耐压艇体、艇翼、升降舵、垂直尾翼、脚踏螺旋桨动力系统、脚踏式排水柱塞缸系统、艇内水箱、艇外升降水囊、风帆及操纵系统、以及生命支持系统、通信及全球定位系统、声纳系统等构成。

其工作原理是：潜艇的艇内水箱和艇外升降水囊以及脚踏式排水柱塞缸及相应的连接阀门是一个封闭系统，通过相应的管路连接起来。艇外水囊是由高强度和高弹性软体材料构成，对称的置于艇体下方的两侧。在潜艇处于水面状态时，水囊内充满了水。打开与艇内水箱之间的连接阀门，因为艇外水囊的水的压力在正常情况下始终比艇内水箱高，所以这时水囊内的水向艇内水箱流动，水囊收缩，潜艇的排水体积逐步缩小，潜艇逐步下沉，当体积缩小到一定程度时，艇体的比重大于水，潜艇就会下沉，这时关闭阀门，拉动升降舵操纵杆，将升降舵的角度调整好，将下沉的重力通过机翼变化成前进的动力。就可以让潜艇成一定的角度向下前方运动。当潜艇达到安全深度的界限时，踏动排水柱塞缸，通过连接阀门和单向阀门，将水箱内的水排到水囊内，这时水囊膨胀，潜艇的比重下降，当比重小于水时，潜艇上浮，通过机翼将这种浮力变化成前进的动力，这时通过升降舵操纵杆调整好升降舵的角度，就可以让潜艇成一定的角度向上前方运动，直到浮出水面。如果不使潜艇浮出水面，可以在潜艇到达一定的高度后，将水囊内的水再排入水箱，重复前一个下潜过程，这样往复排放，使潜艇成之字形在水下前进。

当潜艇的比重与水相同时，潜艇在水中处于一种相对稳定的状态，这时可以靠脚踏螺旋桨推动潜艇前进。通过升降舵和垂直舵来控制潜艇的运动方向。

当情况需要时，可以将其浮出水面，将帆翼升起，靠风力前进。也可以同时踏动螺旋桨驱动潜艇前进。

对于本滑翔潜艇来说，由于其生活空间狭小，其海上独立生存环境比较恶劣，这就要求它必须充分的利用一切可利用的空间。所以用来控制潜艇升降的系统是相对封闭的，工作液体可以是淡水。当潜艇配有海水过虑淡化装置和小型发动机时，水箱内相对独立的空间也可以贮存部分油料。

为加快潜艇的上浮和运行速度，也可以去掉或设而不用升降水囊3，下沉时，将海水直接注入艇内水箱，上浮时，将艇内水箱的水直接排入海洋。

由于采用上述技术方案，使得本滑翔潜艇即具有不需动力配置、操纵灵活、的特点，又具有良好的驱动效率与速度和极好的隐蔽性能（没有任何噪音）。使其在海底探险、旅游观光等方面具有一定的实用性，也可以在某种情况下用于军事目的。

下面结合附图及实施例对本发明做进一步的说明。

附图1是本滑翔潜艇为帆翼结构时的示意图，A是前视图、B是俯视图、C是侧视图、D是潜艇处于水面靠帆翼驱动时的示意图、E是本滑翔潜艇的升降控制原理图。

附图2是一个配有普通艇翼的滑翔潜艇，此艇翼也可以设在艇体的上方，因为附图1将帆翼配置在了艇体的上方，所以本示意图将艇翼配置在了艇体的中部。一般来说，艇翼配置在艇体的上方对保持潜艇的稳定和减小前进阻力更有效。

图中艇体1、升降舵2、升降水囊3、供氧孔及拖拽点4、艇门及观测窗5、垂直尾翼6、艇翼或帆翼7、螺旋桨8、帆翼固定栓9、帆翼升降控制绳10、舵11、弹性帆翼固定绳12、防撞点及控制绳传动与固定轮13、可调帆翼固定栓14、帆翼角度控制轮及帆翼控制绳进入艇体点15、帆翼支撑杆16、帆翼顶端支撑杆17、帆翼底端支撑杆18、帆翼角度控制绳19、帆翼角度控制轮20、帆翼升降控制轮21、座椅22、螺旋桨传动轴23、艇内水箱24、推力轴承及轴封25、舵操纵杆26、脚踏式伞齿轮盘27、螺旋桨轴头啮合伞齿轮28、高压氧气瓶29、充气阀30、水囊排水阀31、柱塞缸脚踏板32、脚踏板联动杆33、柱塞缸34、水箱单向排水阀35、单向阀36、下潜控制阀37、水箱排水阀38、进气阀39、潜艇超压保护充气阀40。

在附图1中，潜艇的工作原理是：潜艇的艇内水箱24、艇外升降水囊3、脚踏式排水柱塞缸34、以及各种阀门和管路是一个封闭系统，通过相应的管路连接起来。在潜艇处于水面状态时，升降水囊3内充满了水或气体，此时潜艇处于水面工作或半潜式工作状态。此时，可以通过操纵帆翼角度控制轮20和帆翼升降控制轮21，升起帆翼7，并调整好迎风角度，借助风力前进（见附图1D）。在水面状态时，也可以靠踏动脚踏式伞齿轮盘27、通过螺旋桨轴头啮合伞齿轮28、螺旋桨传动轴23、带动螺旋桨8旋转，从而推动潜艇前进。必要时以上这两种驱动方式可以同时使用。

当要把潜艇转入水下工作状态时，打开下潜控制阀37、因为艇外升降水囊3内的水的压力在正常情况下始终比艇内水箱24高，所以这时水囊3内的水向艇内水箱24流动，水囊3收缩，潜艇的排水体积逐步缩小，潜艇逐步下沉，当体积缩小到一定程度时，艇体的比重大于水，潜艇就会下沉，这时关闭阀门，拉动升降舵操纵杆，调整好升降舵2的角度，就可以让潜艇成一定的角度向下前方运动。当潜艇达到安全深度的界限时，踏动柱塞缸脚踏板32，使柱塞缸34工作，通过水箱单向排水阀35和单向阀36，将水箱24内的水排到水囊内3，这时水囊3膨胀，潜艇的比重逐步下降，当比重小于水时，潜艇上浮。这时调整好升降舵2的角度，就可以让潜艇成一定的角度向上前方运动，直到浮出水面。如果不使潜艇浮出水面，可以在潜艇到达一定的高度后，将水囊3内的水再排入水箱，重复前一个下潜过程，这样往复排放，使潜艇成之字形在水下前进。

当潜艇的比重与水相同时，潜艇在水中处于一种相对稳定的状态，这时可以靠脚踏螺旋桨推动潜艇前进，用升降舵2和舵11控制潜艇的运动方向。

附图1E是本滑翔潜艇的升降控制原理说明图。潜艇下沉时，打开下潜控制阀37，升降水囊3内的水流入艇内水箱24，水囊3收缩，潜艇的比重逐渐加大，当潜艇的比重大于水时，潜艇产生向下运动的重力，此重力的大小由潜艇的比重决定。潜艇上浮时，踏动柱塞缸脚踏板32，使柱塞缸34工作，将水箱24内的水通过水箱单向排水阀35、柱塞缸34、单向阀36排入升降水囊3内，这时水囊3逐步膨胀，潜艇的比重逐步下降，当比重小于水时，潜艇开始上浮。当需要给升降水囊3充气时，打开进气阀39，踏动柱塞缸脚踏板32，使柱塞缸34工作就可以将气体充入升降水囊3内。潜艇超压保护充气阀40与相应的机械与电气保护部件连接，其功能是，当潜艇达到下潜极限而操作员未采取相应的措施时，此阀门打开，将艇内水箱的部分水排出艇内，使潜艇上浮。如果这一操作步骤无效，则通过充气阀30直接向升降水囊3内充气，使潜艇强行上浮，保护艇内人员的安全。

当潜艇滑翔前进时，也可以同时踏动螺旋桨加快前进速度。

附图2是一个配有普通艇翼7的滑翔潜艇，此艇翼也可以设在艇体的上方，一般来说，艇翼配置在艇体的上方对保持潜艇的水下稳定和减小水面前进阻力更有效。在潜艇处于水面状态时、艇翼7应露出水面，以减少前进阻力。这时可以踏动脚踏式伞齿轮盘27，通过螺旋桨轴头啮合伞齿轮28、螺旋桨传动轴23、带动螺旋桨8旋转，从而推动潜艇前进。

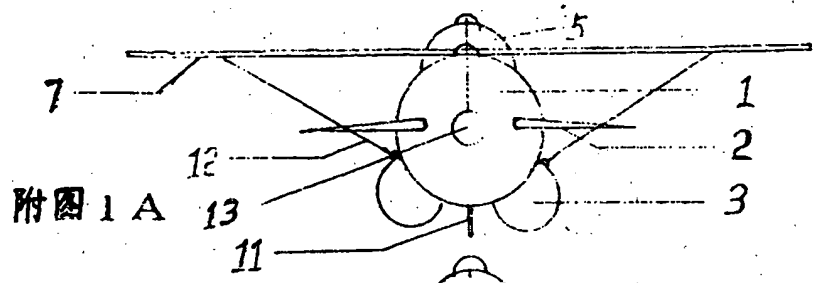
当要把潜艇转入水下工作状态时，打开下潜控制阀37、因为艇外升降水囊3内的水的压力在正常情况下始终比艇内水箱24高，所以这时水囊3内的水向艇内水箱24流动，水囊3收缩，潜艇的排水体积逐步缩小，潜艇逐步下沉，当体积缩小到一定程度时，艇体的比重大于水，潜艇就会下沉，这时关闭阀门，调整好艇翼7和水平尾翼2的角度，就可以让潜艇成一定的角度向下前方运动。当潜艇达到安全深度的界限时，踏动柱塞缸脚踏板32，使柱塞缸34工作，通过水箱单向排水阀35和单向阀36，将水箱24内的水排到水囊内3，这时水囊3膨胀，潜艇的比重下降，当比重小于水时，潜艇上浮。这时调整好艇翼7和水平尾翼2的角度，就可以让潜艇成一定的角度向上前方运动，直到浮出水面。如果不使潜艇浮出水面，可以在潜艇到达一定的高度后，将水囊3内的水再排入水箱，重复前一个下潜过程，这样往复排放，使潜艇成之字形在水下前进。

当潜艇的比重与水相同时，潜艇在水中处于一种相对稳定的状态，这时可以靠脚踏螺旋桨推动潜艇前进，用升降舵2和舵11控制潜艇的运动方向。

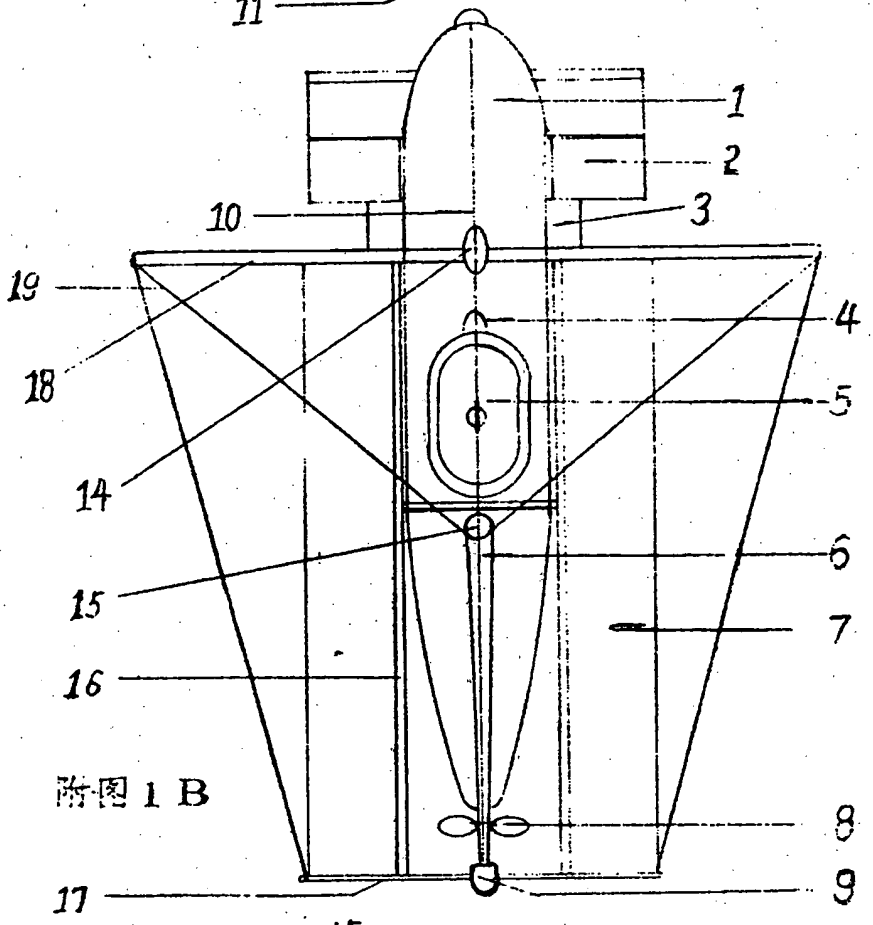
当潜艇滑翔前进时，也可以踏动螺旋桨加快前进速度。

01·01·02

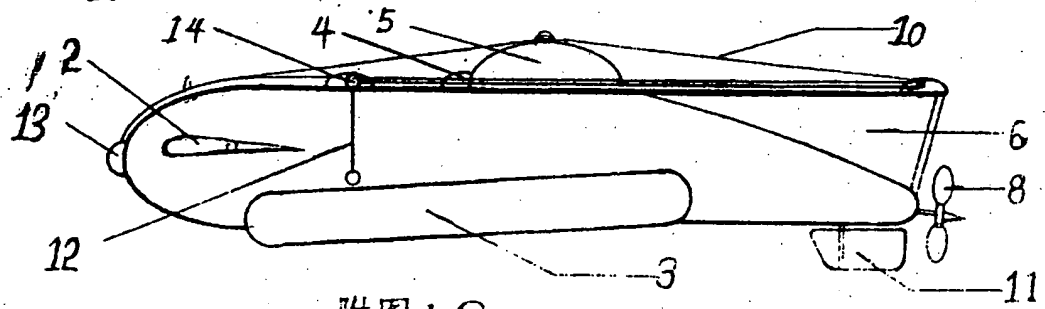
说 明 书 附 图



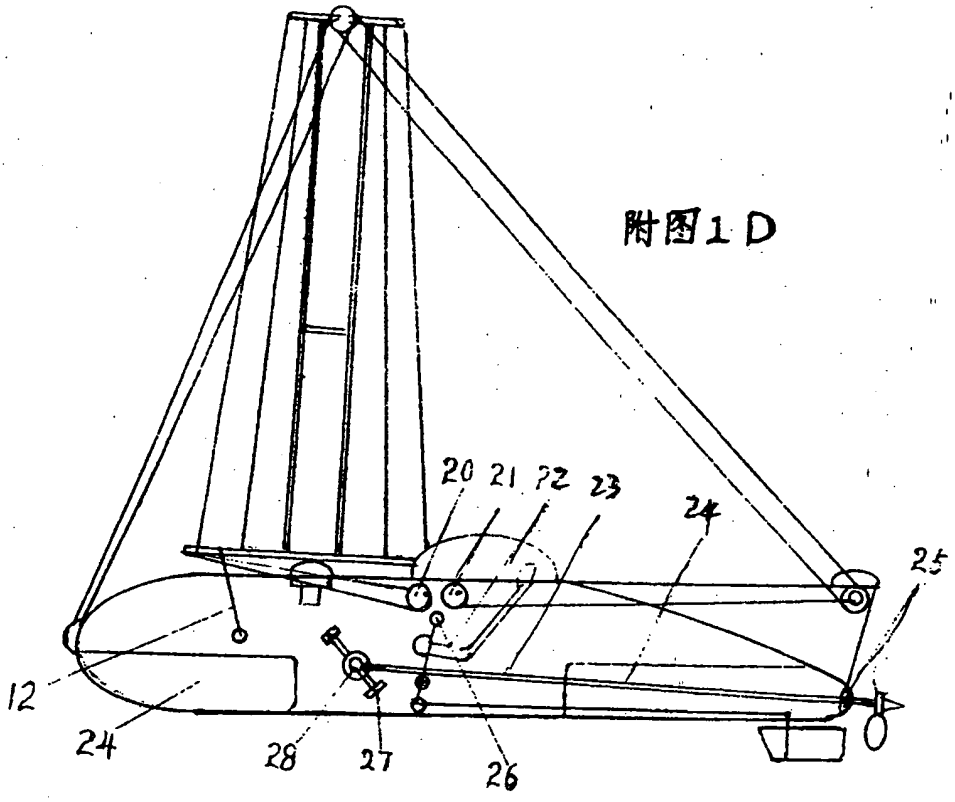
附图1A



附图1B



附图1C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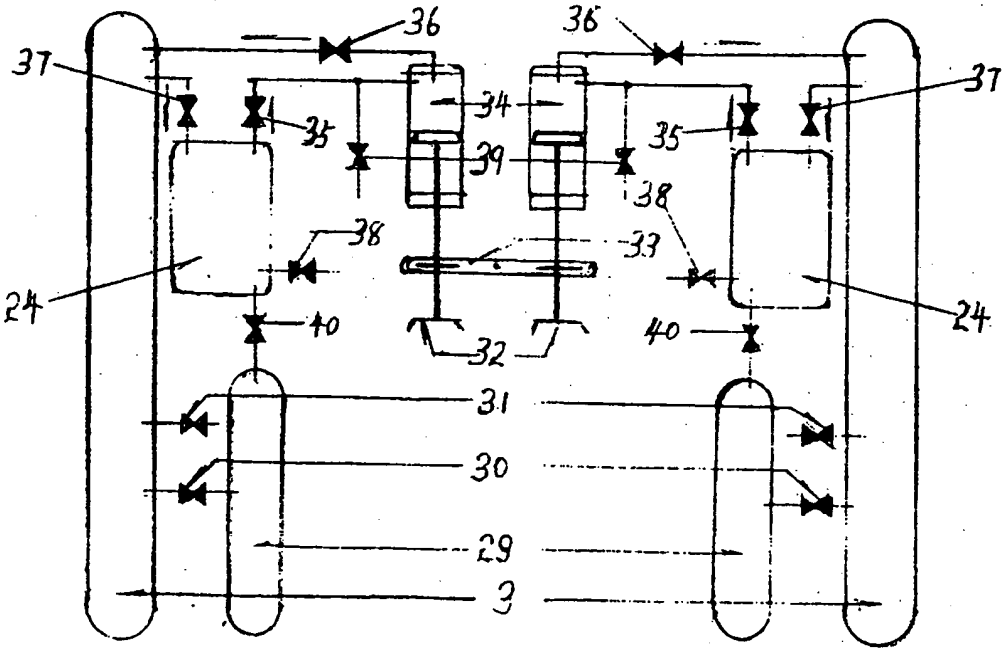
附图1D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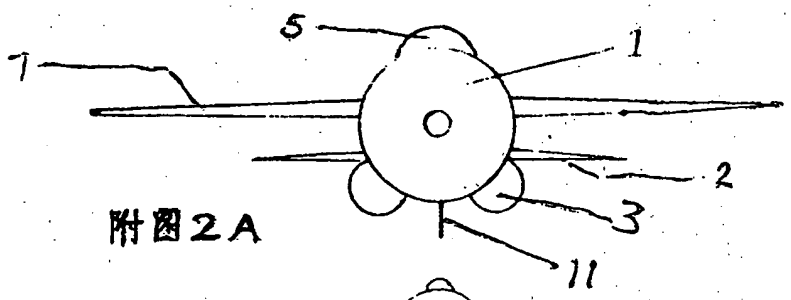
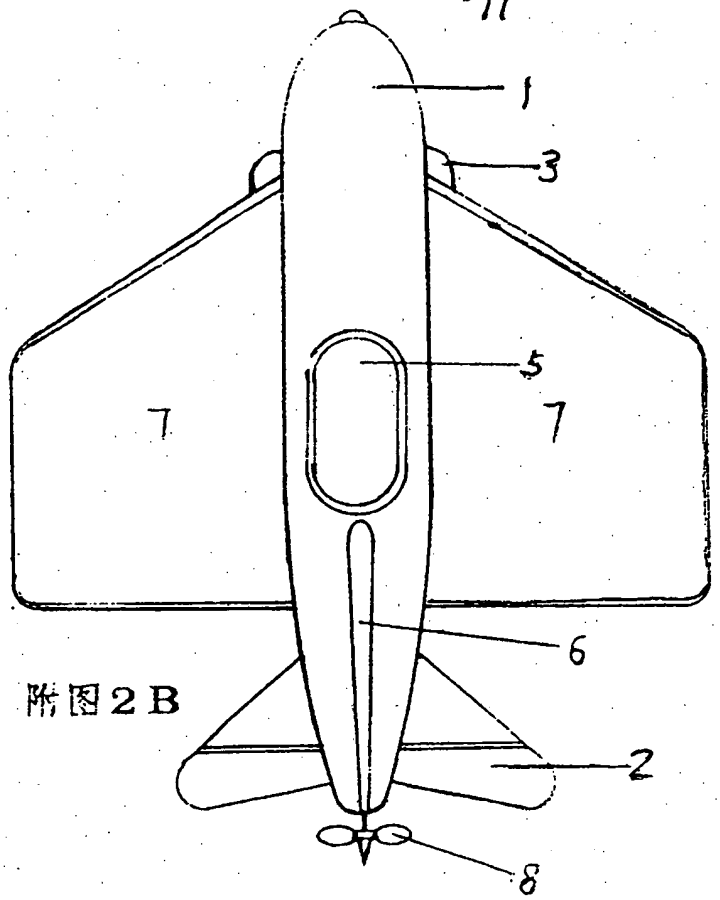
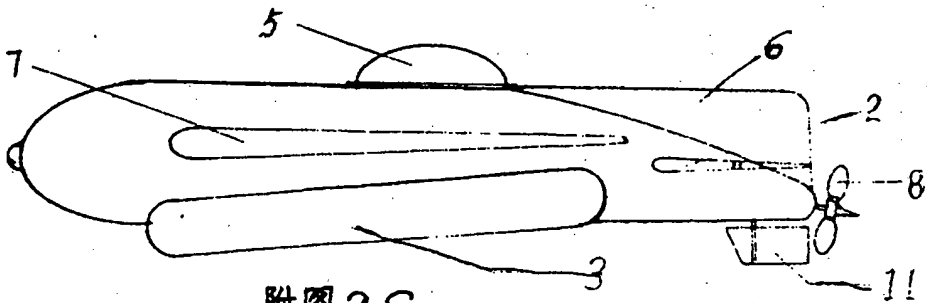
附图1E



附图2A



附图2B



附图2C